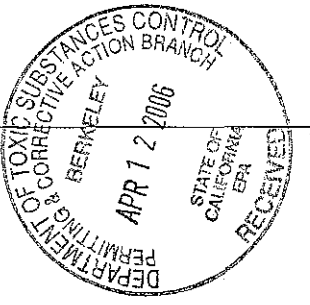
GROUND ZERO ANALYSIS, INC.

1714 Main Street
Escalon, California 95320-1927
Telephone: (209) 838-9888
Facsimile: (209) 838-9883



REVISED HEALTH RISK ASSESSMENT REPORT

Prepared for

FORMER PURE-ETCH, CO. FACILITY
1031 INDUSTRIAL WAY
SALINAS, CALIFORNIA 93906

Prepared by

ORIGINAL SIGNED BY

John P. Lane
CA Registered Geologist No. 6795

April 10, 2006

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Former Pure-Etch, Co. Facility
1031 Industrial Way
Salinas, California 93901

EXECUTIVE SUMMARY

The purpose of the health risk assessment was to develop a set of health and environmental criteria to which measured and/or predicted concentrations of hazardous constituents determined during the release characterization could be compared in order to evaluate the need for further site characterization, risk assessment, or corrective measures.

The Site occupies approximately 1.25 acres in an industrial area of Salinas at the southeast corner of Industrial Way and Vertin Avenue. Surrounding property use is primarily industrial, with some commercial use. The nearest surface water body is Alisal Slough, located more than 2,000 feet southwest of the Site. Drinking water wells in the Salinas area generally draw water from well below 180 feet. The nearest known water supply well is located more than 1,000 feet north (upgradient) of the Site.

Pure-Etch obtained the Site from Georgia Pacific Corporation in 1993 and conducted operations until it was closed in 1998. Pure-Etch did not operate any underground storage tanks (USTs). Prior to Pure-Etch's purchase of the Site, previous owners had legally closed a 1,000-gallon UST in place in 1985 by filling it with concrete. The tank had reportedly not been in use for 10 to 25 years prior to its closure in 1985. The entire Site is now paved. Twenty-five sites within ¼ mile of the Site were listed in a recent VISTA Report as having USTs, including at least five that have a documented release of petroleum hydrocarbons.

Subsurface investigations at the Site conducted since 1997 determined that soil and groundwater beneath the UST has been impacted by a release of petroleum hydrocarbons. Soil contamination at the Site is generally limited to a relatively small area in the vicinity of the UST and lies primarily within the upper clay/silt unit and the upper sand unit to a depth of approximately 40-45 feet below ground surface (bgs), although soil contamination is also present within the capillary fringe zone at approximately 55 feet bgs. An estimated 27,000 pounds of gasoline remains in soil beneath the site.

The dissolved gasoline plume encompasses an area of approximately 33,000 square feet and the leading edge of the main plume extends approximately 140 to 150 feet downgradient of the source area. The dissolved contaminant plume has partially migrated only 60-65 feet off-site beneath Industrial Street at the southwestern property boundary. An estimated 56 pounds of gasoline is present in the dissolved contaminant plume.

Ground Zero adopted a tiered approach in conducting the health risk assessment, first conducting a conservatively biased source-based health screening assessment pursuant to DTSC's Preliminary Endangerment Assessment Guidance Manual (PEA) to estimate a reasonable maximum exposure (RME) to a sensitive population, then conducting a receptor-based exposure assessment that evaluates site specific factors in establishing exposure pathways and risk/hazard equation parameters.

Although the results of the PEA compliant risk screening evaluation suggests that subsurface contamination beneath the Site represent unacceptable risk/hazard in a residential setting, it is clear that the risk screening evaluation is a conservatively biased estimate of the upper bound of exposure. Actual site conditions, including its location, zoning, and the regional hydrogeology of the Salinas area, result in the elimination of direct dermal exposure and ingestion of soil or groundwater as exposure pathways. For industrial Site use, site specific risk assessment suggests that, from a receptor-based standpoint, no further action at the site is warranted.

However, analytical results of soil samples collected at the site suggests that soil contamination remains in the vadose zone, which represents a continuing source of groundwater degradation via leaching of contaminants to the groundwater and/or contaminant partitioning. In addition, the dissolved hydrocarbon plume is migrating off-site beneath Industrial Street along the southwestern Site boundary. Thus corrective measures and preliminary remediation goals (PRGs) at the site should focus on reducing residual hydrocarbons in soil to prevent continued degradation of shallow groundwater beneath the site and plume migration control to prevent further off-site migration of the dissolved petroleum hydrocarbon plume.

Based upon the objectives listed above, Ground Zero initially proposed PRGs for soil using the values established by USEPA Region IX PRGs for industrial Site use. For groundwater, Ground Zero proposed PRGs that would result in a reduction of the current concentrations of constituents of concern in groundwater by about 95%. In a memorandum dated August 2, 2005, which was included with correspondence dated August 5, 2005, DTSC concurred with Ground Zero's proposed PRGs for contaminants in soil, but disagreed with the proposed PRGs for groundwater. DTSC required that the proposed PRGs for groundwater be equal to the primary Maximum Contaminant Levels (MCLs) established by the State. The revised PRGs for the site are discussed in this Revised Health Risk Assessment Report.

HEALTH RISK ASSESSMENT REPORT
Former Pure-Etch, Co. Facility
1031 Industrial Way
Salinas, California 93901

1.0 INTRODUCTION

The purpose of the health risk assessment was to develop a set of health and environmental criteria to which measured and/or predicted concentrations of hazardous constituents determined during the release characterization could be compared in order to evaluate the need for further site characterization, risk assessment, or corrective measures. The following general procedures were used to conduct the health risk assessment:

1. Conduct a human health screening evaluation pursuant to procedures outlined in the *Preliminary Endangerment Assessment Guidance Manual* (DTSC, 1994). This screening evaluation is intended to be a health-conservative preliminary evaluation of risk and hazard and mandates the following:
   a) Assumes residential land use;
   b) Assumes that inhalation, ingestions, and dermal absorption are all applicable exposure pathways regardless of actual site conditions;
   c) Requires the use of the maximum detected concentration of each specific chemical detected during the investigation;
   d) Establishes default exposure factors that must be used in the calculation of risk/hazard. The default factors are chosen to represent a reasonable maximum exposure in a residential setting at Superfund sites.

2. Conduct additional risk assessment incorporating site specific factors including:

   a) Evaluating actual present and probable future land use;
   b) Characterizing the exposure setting;
   c) Identifying exposure pathways;

d) Establishing exposure parameters based upon land use;

e) Quantifying exposure.

3. Evaluate subsurface vapor intrusion to indoor air pursuant to *Interim Final Guidance for the Evaluation and Mitigation of Subsurface Vapor Intrusion to Indoor Air* (DTSC, 2004).

This report summarizes the procedures and results of the health risk assessment conducted for the site by Ground Zero.

2.0 SITE BACKGROUND AND PHYSICAL SETTING

2.1 Property Use

The Site is located at 1031 Industrial Way, Salinas, California. The Site occupies approximately 1.25 acres in an industrial area of Salinas at the southeast corner of Industrial Way and Vertin Avenue. Surrounding property use is commercial and industrial. The nearest surface water body is Alisal Slough, located more than 2000 feet southwest of the Site. The Site location is shown on Figure 1.

The Site is currently occupied by Trécé Inc., which manufactures insect monitoring products, and an automobile towing company. The Site was previously operated as an etchant recycling facility by Pure-Etch from approximately 1994 to 1998. Pure-Etch obtained the property from Georgia Pacific Corporation in 1993. Prior to Pure-Etch's purchase of the Site, previous owners had legally closed a 1000-gallon underground storage tank (UST) in place in 1985 by filling it with concrete. The tank had reportedly not been in use for 10 to 25 years prior to its closure in 1985. Pure-Etch did not operate any underground storage tanks. The Site is entirely covered with relatively impermeable materials, which include concrete slab structures over approximately 80% of the Site and asphalt or concrete over the remaining 20%. A rail spur enters the southwest portion of the Site from the west. A site plan is presented on Figure 2.

In 1997 the State of California Department of Toxic Substance Control (DTSC) and the Monterey County Department of Environmental Health (MCDEH) requested that Pure-Etch undertake an investigation to determine if any fuel had leaked from the tank.

2.2 Physical Setting

The Site is located in the Salinas Valley, in the central portion of the Coast Ranges physiographic province of California. The Valley is defined by the Gabilan Range to the east and the Santa Lucia Range to the west. The Salinas Valley is underlain by the Salinas Ground Water Basin, created by regional downwarping and localized reverse and strike slip faulting along the eastern range front of the Santa Lucia Range. This basin is post-Miocene synclinal graben-trough with a repository of thick mid-late Cenozoic sediments up to 8,000 feet thick (Bowen, 1965).

The Salinas Valley Ground Water Basin contains a series of deep productive aquifers, which are mined intensively to supply water for agricultural, domestic, and industrial purposes. The northern end of the Valley has two major low permeability confining strata which separate the alluvial fill into three water bearing units: an unconfined zone, the 180-foot aquifer, and the 400-foot aquifer. The 180-foot and 400-foot aquifers are highly developed sources of water for irrigation and domestic use. A deeper, 900-foot aquifer has also been identified regionally. The unconfined zone yields water slowly, is of poor quality, and is rarely tapped as a water source (Showalter, 1984). The shallowest aquifer underlying Salinas is the unconfined "A-aquifer," composed of interbedded and interfingering sands, gravels, silts, and clays. This aquifer is underlain by a relatively continuous impermeable blue clay layer at approximately 180 feet (California Department of Water Resources, 1973).

Since perched groundwater is present in the shallow, unconfined zone, depth to first groundwater is variable across the City of Salinas. Regional groundwater flow direction across the Salinas area is generally west-northwest towards the Pacific Ocean. The shallow aquifer has been encountered at the Granite Construction Company site (1161 Abbott Street) in a sand aquifer at a depth of 80 to 100 feet bgs. The Granite Construction Company has monitoring wells less than 1,500 feet southwest of

the Pure-Etch property (ASE Environmental, December 15, 1993 Remedial Action Plan). According to Mr. John Goni of the RWQCB, the groundwater flow direction at the Granite Construction site has varied considerably and it has been difficult to determine a predominant local groundwater flow direction.

A nearby water supply well is located at the Shippers Development Company site at 634 South Sanborn Road less than 1,000 feet north (upgradient) of the Pure-Etch site. The upper perforations of the water supply well reportedly begin at 235 feet bgs.

On March 9, 2000, VISTA Information Solutions, Inc. conducted a search of regulatory documentation designed to identify sites within one mile of the Site. The search identified 25 sites within ¼ mile of the Site as having USTs. Five of these identified sites, as well as 13 others within ½ mile of the Site, are listed as having had leaking USTs (LUSTs). At least two of the LUST sites are located within 1/8 mile of the Site. A copy of the VISTA report was presented in the April 12, 2000 *Workplan for Investigation of Soil and Groundwater Contamination from Former Gasoline Storage UST at 1031 Industrial Street, Salinas, California*, submitted by Lee & Pierce Inc.

Further review of documents at the MCDEH was conducted on sites identified in the VISTA report. Significant findings include the presence of free-phase petroleum product at the Granite Construction site (1161 Abbott Street) approximately 1,000 feet southeast of the Site, and an on-going investigation for gasoline constituents in groundwater at the Mitchell Silliman site, located approximately 1/3 mile southeast of the Site. Figure 3 presents an aerial photograph showing these properties in relation to the Site.

2.3 Contamination Investigation, Regulatory Enforcement and Interim Actions

Investigations related to contamination from the UST began at the property in 1997.

2.3.1 Underground Storage Tank Investigations

A previous tenant operated one underground storage tank (UST) on the Site. The steel UST was

used for storage of gasoline fuel. Previous owners of the property closed the tank in place in 1985 by filling it with concrete. The tank was reportedly not used for 10 to 25 years prior to being closed.

2.3.2 Subsurface Investigations

Soil and groundwater investigation was initiated in 1997 at the request of DTSC and MCDEH as a precursor to plant closure. Three borings were advanced in the vicinity of the closed UST. Two of the borings located within 10 feet of the UST, BH-1 and BH-2, exhibited elevated levels of gasoline constituents. Soil vapor samples were collected from each boring at a depth of approximately 15 feet bgs. Each of the three samples contained gasoline constituents, with the sample collected from BH-1 recording the highest level at 18,000 micrograms per liter (µg/L) total petroleum hydrocarbons as gasoline (TPHg).

Groundwater was not encountered during the 1997 investigation. The drilling was terminated at approximately 40 feet bgs.

In response to a Corrective Action Consent Agreement (Consent Agreement) between Pure-Etch and the DTSC signed on February 14, 2000, Pure-Etch authorized an additional investigation in order to determine the lateral and vertical extent of impact to soil and to determine if there had been an impact to groundwater. Seven additional soil borings were advanced in July and August 2000 by Ground Zero. Three borings located within 20 feet of the UST (BH-6, BH-8, BH-10) exhibited elevated levels of gasoline constituents in the vadose zone and at the capillary fringe, three borings located east (BH-5) and south (BH-4 and BH-7) of the former UST exhibited elevated levels of gasoline constituents primarily at the capillary fringe, and one boring north of the UST (BH-9) exhibited no evidence of gasoline contamination. Soil vapor samples collected from the boring located nearest the UST from a permeable sand zone at a depth of approximately 16 feet bgs contained concentrations of gasoline constituents five orders of magnitude greater than those detected in the vapor sample collected from the silt/clay unit at 7 feet bgs. These results suggest that the upper clay/silt unit is an effective barrier to upward migration of hydrocarbon vapors to the atmosphere. Discrete groundwater samples collected from borings BH-4 through BH-9 indicated that the highest concentrations of dissolved gasoline constituents were present in areas

south and east of the former UST.

At the direction of DTSC, five groundwater monitoring wells (MW1 through MW5) were installed at the Site in June 2002 to characterize hydrology and water quality of shallow groundwater beneath the site. The investigation confirmed that soil contamination at the Site is generally limited to a relatively small area in the vicinity of the UST and lies primarily within the upper clay/silt unit and the upper sand unit to a depth of approximately 40-45 feet bgs. Based upon initial groundwater monitoring data, shallow groundwater beneath the site flows generally in a southeasterly direction. Free petroleum product measuring 1.42 feet thick was present in well MW1, located south of the UST, and elevated dissolved gasoline constituents were present in well MW4, located southeast of the UST.

Additional investigation was conducted in order to estimate the lateral extent of documented dissolved gasoline constituents in shallow groundwater beneath the site, to determine if previously documented free-phase gasoline had migrated downgradient of well MW1, to obtain sufficient additional contaminant concentration data in soil gas and physical characteristics of soil beneath the site to evaluate contaminant migration pathways and the potential exposure to on-site and nearby workers, and to obtain sufficient information on physical characteristics of soil and groundwater beneath the site to evaluate potential remediation measures. Ground Zero directed the installation of six additional groundwater monitoring wells (MW6 through MW11), a soil vapor extraction test well (VW1), and six soil vapor probes (within the annular space of wells MW6, MW9, and MW11). The additional investigation determined that the downgradient extent of groundwater contamination was limited to within site boundaries, as no petroleum hydrocarbon constituents were detected in downgradient wells MW8, MW9, and MW10.

Figure 4 presents the locations of soil borings and monitoring wells drilled at the site. Summary tables of soil, groundwater, and soil vapor samples collected at the site are included in Appendix A along with a summary of groundwater elevation data. Detailed summaries subsurface investigations conducted at the site are contained in the following reports:

- *Underground Storage Tank Site Investigation Report, prepared for Pure-Etch Company, 1031 Industrial Way, Salinas, California 93901*, April 1997, prepared by CapRock.
- *Phase II RCRA Facility Investigation, Former Pure Etch Facility, 1031 Industrial Way, Salinas, CA 93906, February 16, 2001*, prepared by Ground Zero and Lee & Pierce, Inc.
- *Revised Phase II RCRA Facility Investigation Report, Former Pure-Etch Facility, 1031 Industrial Way, Salinas, CA 93906, July 19, 2002*, prepared by Ground Zero.
- *Phase III RCRA Facility Investigation Status Report, Former Pure-Etch Facility, 1031 Industrial Way, Salinas, CA 93906, March 23, 2004*, prepared by Ground Zero.

2.3.3 Interim Remedial Actions

Well MW1 contained more than one foot of free-phase gasoline in the well casing on June 18, 2002. Ground Zero initiated bi-weekly free product monitoring and removal on October 24, 2002. Field technicians hand bailed free product from well MW1 on nine occasions between October 24, 2002 and October 14, 2003. No measurable free product was present in well MW1 between January 6, 2003 and July 17, 2003. Less than one inch of free product was measured in the well between August 19, 2003 and October 14, 2003. No free product has been measured in well MW1 since October 14, 2003. A total of approximately 2.15 gallons of product/water mixture has been removed from the well. No indications of free-phase gasoline have been observed in any other site well.

3.0 SITE SPECIFIC SUBSURFACE CONDITIONS

3.1 Physical Conditions

Soil stratigraphy encountered during subsurface investigations can generally be divided into the following laterally continuous units:

Upper clay/silt unit: extends from the ground surface to approximately 14/16 feet bgs and consists primarily of lean to fat clay with silt (with no coarse material). According to the results

of physical testing conducted by Cooper Testing Laboratory, the upper clay unit has an average permeability of 9.E-08 cm/sec, an average moisture content of 30%, and an average organic content of 2.5%.

Upper sand unit: consists of well to poorly graded sand extending from approximately 14/16 feet bgs to 36/44 feet bgs. According to the results of physical testing conducted by Cooper Testing Laboratory, the upper sand unit has an average permeability of 4.E-03 cm/sec, an average moisture content of 5.3%, and an average organic content of 0.5%.

Middle clay unit: consists primarily of lean to fat clay with some silt and extends from approximately 36/44 feet bgs to approximately 55 feet bgs.

Lower silt unit: consists of silt with less than 5% sand and generally extends from approximately 55 feet bgs to approximately 61/64 feet bgs. This unit appears to be thinner in boring BH-6 compared to other site borings. Poorly graded sand was encountered in the upper portion of this unit from approximately 55 to 58/59 feet in borings BH-6 and BH-10, but does not appear to be laterally significant. Wells MW8 through MW11 in the southern and eastern portions of the site did not contain this lower silt unit. Wells MW8, MW9, and MW11 instead transitioned from clay or silty clay directly to a well graded sand approximately 2-5 feet thick at approximately 61/64 feet bgs, which was also encountered in wells MW5 and MW7. No sand or silt was encountered in this unit in well MW10.

Lower clay unit: consists of lean to fat clay and extends from approximately 61/64 feet bgs to the bottom of each well (70-80 feet bgs). Site stratigraphy is graphically represented in cross section on Figures 5 and 6.

Petroleum hydrocarbon odors within the vadose zone were noted in borings drilled in the immediate vicinity of the UST, including in borings BH1, BH2, BH3, BH6, BH8, and BH10, and during drilling of wells MW1, MW6, and VW1. Gasoline odors were noted at the capillary fringe in these

borings and also in borings BH4, BH5, BH7, and wells MW4 and MW7. No odors were noted during drilling of borings BH9 or wells MW2, MW3, MW8, MW9, MW10, or MW11.

The static depth to groundwater beneath the site has ranged from 55.7 to 66.4 feet below the tops of the casings (btoc) in Site wells. Free petroleum product was measured in well MW1, with a maximum thickness of approximately 1.4 feet when the well was installed in June 2001. No free-phase petroleum product has been detected in well MW1 since October 2003. No free-phase petroleum product has ever been encountered in any other site well.

The shallow groundwater gradient beneath the site in the vicinity of the UST generally flows southeast at a gradient between approximately 0.006 ft/ft and 0.012 ft/ft (~31-60 ft/mile). The potentiometric surface appears to be somewhat irregular across the site, however, with an apparent mounding effect beneath the southeastern portion of the site near well MW10 and a groundwater depression near well MW11, which is located inside the warehouse facility. A table of historic groundwater elevations in Site wells is included in Appendix A. A potentiometric surface map generated using the January 2005 well monitoring data is depicted on Figure 7.

3.2 Distribution of Residual Petroleum Hydrocarbons in the Subsurface

3.2.1 Extent of Hydrocarbons in Soil

Laboratory analyses of soil samples collected from borings near the former tank/excavation pit have defined the lateral extent of soil contamination in the vadose zone. Vadose soil contamination of significance was identified in BH1, BH2, BH3, BH6, BH8, BH10, MW1, MW6, and VW1, each of which was drilled within approximately 25 feet of the UST. Soil samples from peripheral borings did not contain contaminants in the vadose zone, although BH5 contained high levels and BH4, MW2, MW4, and MW7 contained low levels of hydrocarbons in soil samples collected from the capillary fringe zone.

The estimated extent of subsurface contamination is shown on the cross sections of Figures 5 and 6

and in Figures B1 through B6 in Appendix B. Ground Zero has estimated that approximately 24,600 pounds of gasoline (as TPHg) are present in the vadose zone soils between the depths of 12 and 52 feet bgs, and approximately 2,500 pounds of gasoline are present in capillary fringe zone and saturated soils between the depths of 52 and 65 feet bgs. By contrast, it appears that the majority of speciated benzene in soil occurs in the capillary fringe and saturated zone. The estimated mass of benzene in the vadose and capillary fringe/saturated zones are 18.5 pounds and 35.5 pounds, respectively. A summary of mass calculations and associated figures are included in Appendix B.

3.2.2 Extent of Hydrocarbons in Groundwater

Analytical results of groundwater samples collected from Site wells in January 2005 indicated that dissolved gasoline constituents are present in wells MW1, MW4, MW6, and MW7 within the Site's boundaries, and at lower levels in off-site wells MW2 and MW5. The wells with greatest impact are wells MW1 and MW6, with moderate levels in wells MW2, MW4, and MW7, and very low levels in well MW5. No gasoline constituents have been detected in upgradient well MW3, downgradient wells MW8, MW9, and MW10, or cross gradient well MW11.

Figures B7 and B8 in Appendix B depict the estimated lateral extent of groundwater contamination as of the January 2005 sampling round. The apparent impacted area measures approximately 33,000 square feet and the leading edge of the main plume extends approximately 140 to 150 feet downgradient of the source area. The gasoline plume appears to be migrating off-site to the west and southwest as indicated by the increasing trend of dissolved contaminants in well MW2.

The volume of impacted groundwater and the mass of dissolved contaminant were estimated by assuming an affected saturated interval of 15 feet (58-73 ft bgs), a total porosity of 30% and estimating the areas of various concentration levels. It is estimated that approximately 1.1 million gallons of groundwater has been affected by dissolved gasoline constituents in the main plume and that the mass of dissolved gasoline (as TPHg) contained therein is approximately 56 pounds. The estimated mass of benzene in the dissolved groundwater plume is 4.9 pounds.

4.0 HEALTH RISK ASSESSMENT

Ground Zero adopted a tiered approach in conducting the health risk assessment. Pursuant to DTSC's request Ground Zero followed the procedures outlined in DTSC's Preliminary Endangerment Assessment Guidance Manual (PEA), dated January 1994, to conducting an initial human health screening evaluation. The purpose of the screening evaluation is to provide an estimate of the potential chronic health hazard from a reasonable maximum exposure (RME) to contamination at the Site and, consequently is considered a conservatively biased source-based assessment assuming residential site use.

Ground Zero also conducted a receptor-based exposure assessment that evaluates site specific factors in establishing exposure pathways and risk/hazard equation parameters.

4.1 Human Health Screening Evaluation

The risk/hazard estimates outlined in the PEA screening evaluation are calculated for exposure pathways most frequently encountered at a residential setting.

According to the PEA guidance manual, the screening evaluation is intended to be a health-conservative preliminary evaluation of potential risk and hazard using narrowly defined default exposure factors which must be used in the calculation of risk/hazard. Using the default factors, the screening evaluation quantifies the potential lifetime risk and hazard from site conditions for a defined set of exposure pathways. Little discretion is allowed on the part of the user in deciding which models, assumptions, and exposure factors to use.

4.1.1 Screening Evaluation Assumptions and Exposure Factors

The following sections outline the required parameters of the human health screening evaluation defined by DTSC in the PEA guidance manual.

4.1.1.1 Land Use

For purposes of the screening evaluation, the land use of the site is assumed to be residential, regardless of the current use and zoning of the site.

4.1.1.2 Exposure Pathways and Media of Exposure

The PEA-compliant screening evaluation requires that the following exposure routes and media of exposure are applicable to residential land use:

Inhalation: airborne dust, volatile organic compounds (VOCs) from soils, VOCs from using household water;

Ingestion: surface water, groundwater (household use only), and incidental ingestion of soil;

Dermal Absorption: direct contact with soil, surface water, and groundwater (e.g., showering).

4.1.1.3 Chemicals of Concern

As indicated in the PEA guidance manual, total petroleum hydrocarbon (TPH) values are not useful for the human health screening evaluation. Since the source of the TPH has been demonstrated to be from gasoline, the critical components are those that have been detected in soil and groundwater beneath the site, primarily benzene, toluene, ethylbenzene, and xylenes (BTEX).

In addition to BTEX constituents, Ground Zero included the probable human carcinogens 1,2-dichloroethane (1,2-DCA) and 1,2-dibromoethane (EDB), as well as the suspected occupational carcinogen naphthalene, as constituents of concern. Other detected constituents, such as trimethylbenzenes, were eliminated as constituents of concern because they were not included in Cal/EPA databases (such as the Toxicity Criteria Database), and others, such as t-butanol (TBA),

were eliminated because they were detected in less than 5% of soil and groundwater samples or at very low levels.

Certain chlorinated solvents detected in groundwater samples collected from Site wells, such as 1,1-dichloroethene, trichloroethene (TCE), and tetrachloroethene (PCE), were eliminated as constituents of concern because they were never used, stored, or handled by Pure-Etch. It should be noted that neither EDB nor 1,2-DCA were ever used, stored, or handled by Pure-Etch but they are present in groundwater beneath the Site. It should be noted that the distribution of 1,2-DCA in perimeter wells (upgradient wells MW3 and MW11 and downgradient well MW5) indicate that 1,2-DCA in groundwater beneath the site is due largely to an off-site source. In addition, EDB was detected in only one of 86 soil samples and only 4 of 64 groundwater samples collected during the investigation, including groundwater samples collected from upgradient well MW3. Both chemicals were included as constituents of concern however, because they are components of leaded gasoline and are considered potential human carcinogens.

The following chemicals were included as constituents of concern for purposes of the health risk assessment:

- Benzene;
- Toluene;
- Ethylbenzene;
- Xylenes;
- 1,2-Dichloroethane (1,2-DCA);
- 1,2-Dibromoethane (EDB);
- Naphthalene.

4.1.1.4 Exposure Point Concentrations

The PEA-compliant screening evaluation requires use of the maximum contaminant value which was found from sampling as the exposure point concentration. The maximum soil value from

sampling was also used for estimating ambient air concentrations, as required by the PEA guidance manual.

For constituents of concern where the sample data indicate the contaminant concentration is below the laboratory detection limit, then the value of the laboratory detection limit was used as the exposure point concentration as required by the PEA guidance manual.

4.1.1.5 Toxicity Values

The hierarchy of toxicity values used in the screening evaluation was as follows:

1. Cancer potency factors (SFs) and chronic reference doses (RfDs) available in the Cal/EPA Toxicity Criteria Database;

2. SFs and RfDs from the Cal/EPA Office of Environmental Health Hazard Assessment (OEHHA) *Human Exposure Based Screening Numbers Developed to Aid Estimation of Cleanup Costs for Contaminated Soil, November 2004, January 2005 Revision*;

3. US EPA Integrated Risk Information System (IRIS), as presented in Region IX Preliminary Remediation Goals (PRGs), October 2004

As required in the PEA guidance manual, an inhalation reference concentration (RfC) was used, when available, to determine the toxicity value for inhalation pathways. The RfC, expressed in mg/m^3, was converted to equivalent RfD values by multiplying the RfC by a ventilation rate of 20 m^3/day and dividing it by an average body weight of 70 kg. Table 1 presents a summary of physico-chemical constants and exposure parameters utilized in the risk assessment.

4.1.2 Risk/Hazard Characterization

For each compound detected at the site Ground Zero utilized the screening evaluation to calculate an upper bound risk and/or hazard for water, soil, and air pathways for a residential Site

use. The excess lifetime cancer risk (termed "$Risk_i$" where "i" is the medium of exposure) was calculated for those compounds considered by the Cal/EPA or USEPA to pose a carcinogenic risk to humans. This value represents the risk, or theoretical probability, of developing cancer from that chemical upon exposure to that medium under the exposure parameters and toxicity values established for the model. The hazard quotient (termed "$hazard_i$" where "i" is the medium of exposure) is calculated for all compounds, carcinogenic as well as non-carcinogenic. This value is a measure of the non-carcinogenic toxicity of a compound; it is not a probability. The hazard quotient is the ratio of the estimated dose from exposure to compounds in a medium to a value that is believed not to produce adverse health effects.

The PEA screening evaluation uses equations for calculating risk and hazard that that have been simplified by incorporating the default values to achieve a reasonable maximum estimation of exposure in a residential setting. The equations for risk and hazard use the same default factors, except for the averaging time (AT). The AT is 70 years for cancer risk, but is set equal to 6 years for non-carcinogenic hazards. Thus, all non-carcinogenic exposures are estimated for a child. The simplified equations allow for calculation of risk and hazard by using the exposure factor and three variables: the chemical-specific toxicity value (SF or RfD), the concentration of the chemical in the medium (C), and a dermal bioavailability term (Kp or ABS). Excerpts from the PEA guidance manual that show the equations and default exposure factors are included in Appendix C.

4.1.2.1 Selection of Pathways

Based upon the characterization of soil and groundwater conducted to date, Ground Zero has determined that the available water data adequately characterizes the nature of groundwater contamination beneath the site and, therefore, PEA-compliant screening evaluation requires that risk/hazard from water, soil, and air be calculated.

4.1.2.2 Water Pathway

The risk and hazard from the water pathway, assuming residential Site use, were calculated using

the equations

$$Risk_{water} = (SFo \times Cw \times 0.0149) + (SFi \times Cw \times 0.0149) + (SFo \times Cw \times 0.0325 \times Kp)$$

and $$Hazard_{water} = ((Cw/RfDo) \times 0.0639) + ((Cw/ RfDi) \times 0.0639) + ((Cw/RfDo) \times 0.0644 \times Kp)$$

Where:

SFo = oral cancer potency slope, $(mg/kg\text{-}day)^{-1}$

SFi = inhalation cancer potency slope, $(mg/kg\text{-}day)^{-1}$

Cw = concentration in groundwater, mg/L

Kp = the chemical specific dermal permeability coefficient from water,

RfDo = oral reference dose, mg/kg-day)

RfDi = inhalation reference dose, (mg/kg-day).

The risk calculated is a summation of ingestion exposure, inhalation of VOCs released from water used indoors, and dermal exposure for a child and an adult. However, hazard is calculated only for the first 6 years of childhood. Table 2 summarizes the results of the calculated risk from all exposure pathways. Table 3 summarizes the results of the calculated hazard from all exposure pathways.

4.1.2.3 Soil Pathway

The risk and hazard from the soil pathway, assuming residential use at the Site, were calculated using the equations

$$Risk_{soil} = (SFo \times Cs \times (1.57\ E\text{-}6)) + (SFo \times Cs \times (1.87\ E\text{-}5) \times ABS)$$

and $$Hazard_{soil} = ((Cs/RfDo) \times (1.28\ E\text{-}5)) + ((Cs/ RfDo) \times (1.28\ E\text{-}4) \times ABS)$$

Where:

SFo	=	oral cancer potency slope, $(mg/kg\text{-}day)^{-1}$
Cs	=	concentration in soil, mg/kg
Kp	=	the chemical specific dermal permeability coefficient from water,
RfDo	=	oral reference dose, mg/kg-day)
ABS	=	absorption fraction, dimensionless.

The risk calculated is a summation of the incidental soil ingestion exposure for a child and an adult and the dermal exposure for a child and an adult. However, hazard is calculated only for the first 6 years of childhood. Table 2 summarizes the results of the calculated risk from all exposure pathways. Table 3 summarizes the results of the calculated hazard from all exposure pathways.

4.1.2.4 Air Pathway

The risk and hazard from the air pathway is based on the exposure to volatile emissions for VOCs generated from contaminated soil. The risk and hazard from the air pathway, assuming residential use at the Site, were calculated using the equations

$$Risk_{air} = SFi \times Ca \times 0.149$$

and $$Hazard_{air} = (Ca/RfDi) \times 0.0639$$

Where:

SFi	=	inhalation cancer slope factor, $(mg/kg\text{-}day)^{-1}$
RfDi	=	the inhalation reference dose, mg/kg-day
Ca	=	ambient air concentration, mg/m^3

The ambient air concentration of a compound can be estimated from the exposure point soil concentration using the equations

$$Ca = Ei/99$$

and $$Ei = ((1.6\ E\ 5) \times Di \times (Hc/Kd) \times Ci)/(\sqrt{(Di \times 0.023/((0.284 + 0.046)(Kd/Hc))}$$

where

Ei = emission rate of contaminant "i" over the residential lot during the exposure interval, mg/sec

Di = diffusivity in air for compound "i", cm^2/sec

Hc = Henry's Law constant, atm-m^3/mole

Kd = soil-water partition coefficient, cm^3/g

Ci = bulk soil concentration of contaminant "i";
(chemical concentration in soil, mg/kg x E-6 kg/mg)

The default exposure factors incorporated into the above equations were modified by Cal/EPA from the VOC emission model recommended by USEPA to coincide more closely with expected residential conditions in California. Emission rates are calculated over the minimum dimensions of a residential lot in California, 5,000 square feet. Table 2 summarizes the results of the calculated risk from all exposure pathways. Table 3 summarizes the results of the calculated hazard from all exposure pathways.

4.1.2.5 Summation of Risk from PEA Screening Evaluation

For cancer risk, the risks from each carcinogen over all exposure media and for all carcinogens were summed to obtain the total excess lifetime cancer risk posed by the contaminants at the Site, assuming residential land use and all exposure pathways are valid. For hazard, the hazard quotients from each compound over all exposure media and for all chemicals were summed to obtain the total hazard index posed by the contaminants at the Site, assuming residential land use and all exposure pathways are valid.

The PEA guidance manual states "In general, a risk estimation greater than E-6 or a hazard index

greater than 1 indicate the presence of contamination which may pose a significant threat to human health. Exceptions will generally include sites with elevated background concentrations, sites where other agency criteria are more stringent, and sites with specific circumstances that allow for a risk management decision to elevate the acceptable screening levels." Using the parameters established by the PEA guidance manual, the screening evaluation indicates that an unacceptable cancer risk and toxicity hazard exist at the site for upper bound exposure in a residential setting. Table 2 summarizes the results of the calculated risk from all exposure pathways. Table 3 summarizes the results of the calculated hazard from all exposure pathways. The critical pathway for residential exposure to subsurface contaminants at the site is water ingestion/dermal contact, which resulted in a total pathway risk of 2.4 E-2. Total pathway risk for soil ingestion/dermal contact and inhalation of contaminants volatilized from contaminated soil were 9.8 E-5 and 8.9 E-6, respectively, which are within USEPA range of acceptable cancer risk between 1 E-4 and 1 E-6.

Although the screening evaluation pursuant to PEA guidelines suggest that the levels of volatile organic compounds in soil and groundwater beneath the Site represent unacceptable risk and hazard at the Site for residential use, it should be noted that the PEA guidelines focus on source-based environmental analysis rather than on receptor-based exposure assessment. In other words, there is very little room for interpretation of actual exposure pathways based upon site conditions and site use.

In a report of OEHHA's Risk Assessment Advisory Committee (1996) entitled *A Review of the California Environmental Protection Agency's Risk Assessment Practices, Policies and Guidelines,* OEHHA recognized that screening approaches such as those outlined in the PEA guidance document use conservative default assumptions to compensate for uncertainties in parameters and models and are useful for identifying low-risk situations which do not require further attention. These screening assessments should be recognized as a conservatively biased estimate of the upper bound of exposure.

4.2 Site Specific Risk Assessment

For comparison with the screening evaluation, Ground Zero conducted a receptor-based exposure assessment that takes into account the current and probable future use of the Site and site specific physical characteristics that affect exposure pathways.

4.2.1 Site Specific Risk Assessment Assumptions and Exposure Factors

The following sections outline the assumptions and exposure factors utilized in conducting a site specific risk assessment.

4.2.1.1 Land Use

The site specific risk assessment focuses on risk and hazard to current occupants of the Site, which is in a heavy industrial area. We have also assumed that the location of the site in this heavy industrial area precludes redevelopment or future residential use.

4.2.1.2 Exposure Pathways and Media of Exposure

The spectrum of possible exposure pathways at a given site for human receptors includes ingestion of contaminated soil or groundwater, dermal contact with contaminated soil or groundwater, and inhalation of vapors. For a given site, one or more of these potential exposure pathways may exist and others may not.

Exposure pathways for potential human receptors were screened to determine which are potentially complete pathways and should be evaluated for risk and hazard. Complete exposure pathways may differ depending upon the property use and potential remediation scenarios. The risk and hazard at the Site were evaluated based upon the assumption that current conditions will remain unchanged with regard to Site use.

<u>Dermal Contact or Ingestion of Contaminated Soil</u>

Under the current use of the property, no worker exposure to contaminated soil exists because no bare soil is exposed. The location of the Site within a heavy industrial region precludes redevelopment for residential use. Consequently, dermal contact and/or ingestion of contaminated

soil is not considered a complete exposure pathway.

Dermal Contact or Ingestion of Contaminated Groundwater

This exposure pathway was also eliminated from consideration. Shallow groundwater in the Salinas area is of poor quality due to saltwater intrusion and heavy agricultural use. Water supply wells in the Salinas area typically are screened well below 180 feet bgs. The depth to groundwater of approximately 60 feet bgs precludes direct contact by site workers.

Inhalation of Vapors from Contaminated Soil or Groundwater

Although contaminated areas at the Site are located beneath concrete/asphalt cover, human exposure to contaminant vapors is a possibility. The toxic contaminants identified at the Site are volatile and exposure could result from vapor migration through the soil into the breathing zone of onsite workers. This exposure pathway was considered in detail.

Indoor and Outdoor Vapor Exposure

The area of soil contamination is located outside the footprint of the building and, consequently, only the potential for outdoor air exposure exists from volatilization of contaminants from subsurface soil. However, the groundwater plume appears to extend beneath a portion of the building. Consequently, both indoor and outdoor air exposures from the volatilization of subsurface contamination were evaluated.

4.2.1.3 Chemicals of Concern

The following chemicals were included as constituents of concern for purposes of the health risk assessment:

- Benzene;
- Toluene;
- Ethylbenzene;
- Xylenes;

- 1,2-Dichloroethane (1,2-DCA);
- 1,2-Dibromoethane (EDB);
- Naphthalene.

4.2.1.4 Exposure Point Concentrations

In order to allow for a reasonable comparison of the site specific risk assessment to the PEA derived screening evaluation, the maximum soil value from sampling was used for the exposure point concentration.

For constituents of concern where the sample data indicate the contaminant concentration is below the laboratory detection limit, then ½ the value of the laboratory detection limit was used as the exposure point concentration. This is a departure from the PEA guidelines, which requires use of the detection limit as the exposure point concentration. However, in this instance the detection limits for 1,2-DCA and EDB used for the screening evaluation were 6.2 milligrams per kilogram (mg/kg), which is substantially higher than the maximum concentrations detected for these constituents of concern because the detection limits were elevated due to interference from other compounds. The actual maximum detected values for 1,2-DCA and EDB in soil were 0.22 mg/kg and 0.056 mg/kg, respectively. Therefore, we felt ½ the detection limit (or an exposure point concentration of 3.1 mg/kg) was more than adequate to conservatively estimate the risk/hazard for these compounds.

4.2.1.5 Toxicity Values

The toxicity values used in the site specific risk assessment were the same as those used in the screening evaluation. Table 1 presents a summary of physico-chemical constants and exposure parameters utilized in the risk assessment.

4.2.2 Risk/Hazard Characterization

For each compound detected at the site Ground Zero calculated a site specific risk and/or hazard for the air pathway (inhalation of vapors volatilizing from subsurface soil and groundwater) for

an industrial Site use. As written previously, direct dermal contact with and/or ingestion of impacted soil and groundwater beneath the site were eliminated as exposure pathways due to the nature of the Site.

To calculate the inhalation risk/hazard associated with industrial use of the site Ground Zero utilized the non-simplified equations included in Appendix B of the PEA guidance manual, modified with the exposure factors appropriate for industrial site use. Since industrial site use assumes that site workers will not be children the portion of the equation that calculates exposure to a child was not used in the calculation of risk/hazard. The equations for risk and hazard use the same default factors, except for the averaging time (AT). The AT is 70 years for cancer risk, but is set equal to 25 years for non-carcinogenic toxicity.

4.2.2.1 Selection of Pathways

Under the current use of the property, no worker exposure to contaminated soil exists because no bare soil is exposed. The location of the Site within a heavy industrial region precludes redevelopment for residential use. Consequently, dermal contact and/or ingestion of contaminated soil are not considered complete exposure pathways.

Groundwater in the shallow "perched" aquifer as well as in the 180-foot aquifer in the Salinas area is of poor quality due to saltwater intrusion and heavy agricultural use. Water supply wells in the Salinas area typically are screened well below 180 feet bgs. The nearest known water supply well is located approximately 1,000 feet upgradient from the subject site. The depth to groundwater of approximately 58-60 feet bgs precludes direct contact by site workers. Consequently, direct exposure or ingestion of contaminated groundwater was also eliminated as an exposure pathway.

Although contaminated areas at the Site are located beneath concrete/asphalt cover, human exposure to contaminant vapors is a possibility. The toxic contaminants identified at the Site are volatile and exposure could result from vapor migration through the soil into the breathing zone of onsite workers. Therefore, this exposure pathway was considered in detail.

4.2.2.2 Outdoor Air Pathway

The risk and hazard from the air pathway is based on the exposure to volatile emissions for VOCs generated from contaminated soil. The risk and hazard from the air pathway under the current and probable future use of the Site as industrial use were calculated using the equations

$$Risk_{air} = SFi \times Ca \times (IR \times EF \times ED)/(BW \times AT \times 365 \text{ days/yr})$$

and

$$Hazard_{air} = (1/RfDi) \times Ca \times (IR \times EF \times ED)/(BW \times AT \times 365 \text{ days/yr})$$

Where:

SFi	=	inhalation cancer slope factor, $(mg/kg\text{-}day)^{-1}$
RfDi	=	the inhalation reference dose, mg/kg-day
Ca	=	ambient air concentration, mg/m^3
IR	=	inhalation rate, 20 m^3/day
EF	=	exposure frequency, 250 days/yr
ED	=	exposure duration, 25 years
BW	=	body weight, 70 kg
AT	=	averaging time, 70 years for carcinogen and 25 years for non-carcinogen

The ambient air concentration of a compound can be estimated from the exposure point soil concentration using the equations

$$Ca = Ei/99$$

and

$$Ei = ((1.6 \text{ E } 5) \times Di \times (Hc/Kd) \times Ci)/(\sqrt{(Di \times 0.023/((0.284 + 0.046)(Kd/Hc))}$$

where

Ei = emission rate of contaminant "i" over the exposure area during the

exposure interval, mg/sec

Di = diffusivity in air for compound "i", cm^2/sec

Hc = Henry's Law constant, atm-m^3/mole

Kd = soil-water partition coefficient, cm^3/g

Ci = bulk soil concentration of contaminant "i";
(chemical concentration in soil, mg/kg x E-6 kg/mg)

For simplicity in the comparison with the upper bound residential risk calculated by the PEA compliant method discussed in Section 4.1, the emission rates were calculated over the minimum dimensions of a residential lot in California, 5,000 square feet. Table 4 summarizes the results of the calculated risk and hazard from the air pathway in an industrial setting.

50x100

4.2.2.3 Indoor Air Pathway

The equations above were derived to calculate the risk and hazard from the air pathway at the Site but is not specific to indoor air. DTSC recommends an approach for evaluation vapor intrusion into buildings and its subsequent impact on indoor air quality in a document entitled *Interim Final Guidance for the Evaluation and Mitigation of Subsurface Vapor Intrusion to Indoor Air*, December 15, 2004 (Revised February 7, 2005). The guidance document recommends a step-wise approach for the evaluation of vapor intrusion. For sites with existing buildings, the following steps apply:

- Step 1 – Identify the spill(s) or release(s).
- Step 2 – Characterize the site.
- Step 3 – Identify the site as one where vapor intrusion into indoor air may represent a complete exposure pathway (VOCs are detected in the subsurface).
- Step 4 – Identify whether an imminent hazard exists from vapor migrating into indoor air. If none exists,
- Step 5 – Perform a screening evaluation using the default vapor attenuation factors provided in the guidance document. If a potential risk exists,
- Step 6 – Collect additional site data.

- Step 7 – Perform a modeling evaluation using site-specific physical parameters and building parameters as appropriate. If the calculated risk is still significant,
- Step 8 – Prepare an indoor air sampling workplan, which includes an assessment of the utility corridors and the development of a contingency plan for appropriate response actions. Also, conduct appropriate public outreach with the affected community.
- Step 9 – Conduct indoor air sampling.
- Step 10 – Evaluate the data to determine if the indoor air concentrations are acceptable. If they are not,
- Step 11 – Mitigate indoor air exposure, implement engineering controls, and remediate the VOC contamination as appropriate and institute long term monitoring.

Steps 1, 2, and 3: For this site, Steps 1 and 2 have been completed and we can conclude that Step 3 holds true; VOCs have been detected in the subsurface.

Step 4: The identification of an imminent hazard is based on the presence of odors in the building and/or whether any of the building occupants have reported any illnesses (headache, eye irritation, nausea, dizziness, etc.) that may be linked to inhaling hazardous vapors indoors. In this case neither condition exists, so no imminent hazard exists.

Step 5: Ground Zero conducted a preliminary evaluation using the attenuation factors provided in the guidance document. Ground Zero utilized the provided attenuation factor for existing commercial buildings, which reflects reasonable worst-case conditions for California for the contamination of indoor air due to intrusion of vapors migrating from subsurface contamination, in accordance with the guidance document. The following conditions apply on the use of the default attenuation factors: soil gas measurements should be used; maximum contaminant concentrations should be used; fractured bedrock or other preferential pathways should not exist at the site; California toxicity factors should be used; cumulative health effects should be calculated.

The associated cumulative health risk can be quantified by comparing the calculated indoor air concentrations with the OEHHA indoor air screening numbers pursuant to SB32 (OEHHA, 2004, January 2005 Revision). Table 5 presents a summary of the indoor air screening evaluation. Based upon this evaluation, the default parameters result in an acceptable cumulative health risk and no further evaluation is needed.

4.2.2.4 Summation of Risk from Site Specific Risk Assessment

For cancer risk, the risks from all carcinogens were summed to obtain the total excess lifetime cancer risk posed by the contaminants at the Site, assuming its current industrial site use will remain unchanged. For hazard, the hazard quotients all constituents of concern were summed to obtain the total hazard index posed by the contaminants at the Site, assuming its current industrial site use will remain unchanged.

The excess cancer risk for the industrial use at the Site was calculated at 2.6 E-6, which is well within the USEPA range of 1 E-4 to 1 E-6. The calculated hazard quotient is well below 1 and, therefore poses no toxicity hazard. Table 4 summarizes the results of the calculated risk and hazard from subsurface contamination.

The indoor air health risk was evaluated using guidance documents recently published by Cal/EPA and results indicate that an acceptable cumulative health risk exists with regard to indoor air at the Site (Table 5).

4.3 Proposed Site Remediation Goals

Although the results of the PEA compliant risk screening evaluation suggests that subsurface contamination beneath the Site represent unacceptable risk/hazard in a residential setting, it is clear that the risk screening evaluation is a conservatively biased estimate of the upper bound of exposure. Actual site conditions, including its location, zoning, and the regional hydrogeology of the Salinas area, result in the elimination of direct dermal exposure and ingestion of soil or groundwater as exposure pathways.

For industrial Site use, site specific risk assessment suggests that, from a receptor-based standpoint, no further action at the site is warranted. However, analytical results of soil samples collected at the site suggests that soil contamination remains in the vadose zone, which represents a continuing source of groundwater degradation via leaching of contaminants to the groundwater and/or contaminant partitioning. In addition, analytical results of groundwater samples collected at the site indicate that the dissolved hydrocarbon plume is migrating off-site beneath Industrial Street along the southwestern Site boundary. Thus corrective measures and preliminary remediation goals (PRGs) at the site should focus on the following:

1. Reducing residual hydrocarbons in soil to prevent continued degradation of shallow groundwater beneath the site;
2. Plume migration control to prevent further off-site migration of the dissolved petroleum hydrocarbon plume.

Based upon the objectives listed above, Ground Zero initially proposed (*Health Risk Assessment Report, June 24, 2005*) the adoption of PRGs for soil and groundwater as summarized in Table 6. For soil PRGs, Ground Zero adopted the values established by USEPA Region IX PRGs for industrial Site use (EPA, October 2004). For groundwater, Ground Zero proposed PRGs based upon a 95% reduction of the current concentrations of constituents of concern. If the calculated PRG for a particular constituent was below the primary Maximum Contaminant Level (MCL) for drinking water, then the proposed PRG was adjusted to the primary MCL, as in the case for xylenes. For EDB and 1,2-DCA, which were detected in site perimeter wells in what should be considered background concentrations, PRGs were proposed based upon these background concentrations. Since no primary MCL has been established for naphthalene, the taste and odor threshold was selected as the proposed Site PRG for naphthalene.

In a memorandum dated August 2, 2005, which was included with correspondence dated August 5, 2005, DTSC concurred with Ground Zero's proposed PRGs for contaminants in soil, but

disagreed with the proposed PRGs for groundwater. DTSC required that the proposed PRGs for groundwater be equal to the primary MCLs established by the State. The revised PRGs for the site are shown in Table 6.

5.0 REFERENCES

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EPA, 11/86: *Test Methods for Evaluating Solid Waste*, SW-846, US EPA, November 1986

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GZA, 02/01: *Phase II RCRA Facility Investigation, Former Pure-Etch Facility, 1031 Industrial Way, Salinas, CA 93906, February 16, 2001*, prepared by Ground Zero Analysis, Inc. (GZA) with Lee & Pierce, Inc. (L&P)

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GZA, 07/02: *Revised Phase II RCRA Facility Investigation Report, 1031 Industrial Way, Salinas, CA 93906*, prepared by Ground Zero Analysis, Inc., July 17, 2002

GZA, 05/03: *Groundwater Sampling and Analysis Plan, UST Contamination Investigation, Former Pure-Etch Company Site, 1031 Industrial Way, Salinas, CA 93906*, prepared by Ground Zero Analysis, Inc., May 15, 2003

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GZA, 05/03: *Site Safety and Health Plan, Pure-Etch, Company, 1031 Industrial Street, Salinas, California*, prepared by Ground Zero Analysis, Inc., May 2003

GZA, 06/05: *Health Risk Assessment Report, Former Pure-Etch Co. Facility, 1031 Industrial Way, Salinas, California*, prepared by Ground Zero Analysis, Inc., June 24, 2005

L&P, 04/00: *Workplan for Investigation of Soil and Groundwater Contamination from Former Gasoline Storage UST, 1031 Industrial Street, Salinas, CA 93906, April 12, 2000*

OEHHA, 11/04: *Human-Exposure-Based Screening Numbers Developed to Aid Estimation of Cleanup Costs for Contaminated Soil*, Cal/EPA, Integrated Risk Assessment Section, Office of Environmental Health Hazard Assessment, November 2004 (January 2005 Revision)

Showalter, P., : Akers, J.P., and Swain, L.A. *Design of a Groundwater-Quality Monitoring Network for the Salinas River Basin, California: U.S. Geological Survey Water-Resources Investigations Report 83-4049, 74p.*, 1984

TABLE 1
PHYSIO-CHEMICAL AND TOXICITY CONSTANTS
FOR HUMAN HEALTH RISK EVALUATION
FORMER PURE-ETCH FACILITY, SALINAS, CA

CHEMICAL PARAMETER	Physical State		Molecular Weight	Organic carbon partition coefficient, K_{oc}	Diffusivity in air, D_a	Pure component water solubility, S	Henry's Law constant H	Skin Absorption Factor ABS	Cancer Slope Factor Oral CSFo	Cancer Slope Factor Inhaled CSFI	Reference Dose Oral RfDo	Reference Dose Inhaled RfDi	Reference Concentration in air Ca
				(cm^3/g)	(cm^2/s)	(mg/L)	($atm\text{-}m^3/mol$)	(unitless)	$(mg/kg\text{-}d)^{-1}$	$(mg/kg\text{-}d)^{-1}$	(mg/kg-d)	(mg/kg-d)	(mg/m^3)
*BENZENE	V	L	78	6.50E+01	8.80E-02	1.79E+03	5.43E-03	0.10	1.0E-01	1.0E-01	3.0E-03	1.7E-02	9.7E-05
DIBROMOETHANE, 1,2- (EDB)	V	L	188	2.81E+01	7.30E-02	3.40E+03	3.20E-04	0.10	3.6E+00	2.5E-01	9.0E-03	2.6E-03	9.2E-05
*DICHLOROETHANE, 1,2-	V	L	99	1.40E+01	9.10E-02	8.52E+03	9.77E-04	0.10	4.7E-02	7.3E-02	3.0E-02	1.4E-03	2.6E-04
*ETHYLBENZENE	V	L	106	2.20E+02	7.50E-02	1.61E+02	8.44E-03	0.10			1.0E-01	5.7E-01	3.9E-03
*NAPHTHALENE	V	S	128	1.29E+03	6.90E-02	3.17E+01	5.00E-04	0.10	1.2E-01	1.2E-01	2.0E-02	2.6E-03	7.1E-05
*TOLUENE	V	L	92	2.57E+02	7.80E-02	2.57E+02	5.94E-03	0.10			2.0E-01	8.6E-02	3.3E-03
*XYLENES	V	L	106	2.40E+02	8.70E-02	2.40E+02	5.30E-03	0.10			2.0E-01	2.0E-01	1.8E-02

Notes:
Physical state of chemical at ambient conditions (V - volatile, NV - nonvolatile, S - solid, L - liquid, G - gas).
Chemical considered to be "volatile" if Henry's number (atm m3/mole) >0.00001 and molecular weight <200.
Physio-chemical constants and ABS values from DTSC Preliminary Endangerment Assessment Guidance Manual, January 1994.
Cancer Slope Factors and Reference Doses from OEHHA Human Exposure Based Screening Numbers Developed to Aid Estimation of Cleanup Costs for Contaminated Soil, January 2005, where available (marked by "*"); otherwise from USEPA as presented in Region IX PRGs (USEPA 2004).

OTHER INPUST PARAMETERS-INDUSTRIAL SETTING

BW (Adult Body Weight) in Kg	70
ATc (averaging Time for Carcinogens), years	70
Atnc (averaging Time for Noncarcinogens), years	25
EFi (exposure frequency ingestion), days/year	250
ED (exposure duration), years	25
IRw (intake rate water), L/day	1
ET (exposure time during showering/bathing), hr/day	0.25
SAs (skin surface area available for soil contact), sq. cm	5800
IRs (intake rate soil), mg/day	50
EFc (exposure frequency dermal contact) day/yr	40
AF (soil to skin adherance factor) mg/sq.cm	1
IRa (inhalation rate), c. meter/day	20

TABLE 2
Cancer Risk Calculations
Residential Property Use - Maximum Concentrations
Former Pure-Etch Facility, Salinas, CA

CANCER RISK - WATER INGESTION AND DERMAL CONTACT					
COMPOUND	SFo (mg/kg-day)$^{-1}$	SFi (mg/kg-day)$^{-1}$	Cw (mg/L)	Kp	Risk (lifetime excess cancer)
Benzene	1.0E-01	1.0E-01	6.8	2.1E-02	2.07E-02
1,2-dichloroethane	4.7E-02	7.3E-02	0.14	5.3E-03	2.51E-04
Ethylene dibromide	3.6E+00	2.5E-01	0.044	3.3E-03	2.54E-03
Naphthalene	1.2E-01	1.2E-01	0.089	6.9E-02	3.42E-04
TOTAL PATHWAY RISK					2.39E-02
CANCER RISK - SOIL INGESTION AND DERMAL CONTACT					
COMPOUND	SFo (mg/kg-day)$^{-1}$	Cs (mg/kg)	ABS (fraction)		Risk (lifetime excess cancer)
Benzene	1.0E-01	27	0.10		9.29E-06
1,2-dichloroethane	4.7E-02	6.2	0.10		1.00E-06
Ethylene dibromide	3.6E+00	6.2	0.10		7.68E-05
Naphthalene	1.2E-01	27	0.10		1.11E-05
TOTAL PATHWAY RISK					9.82E-05
CANCER RISK - INHALATION					
COMPOUND	Ca (mg/m^3)	SFi (mg/kg-day)$^{-1}$			Risk (lifetime excess cancer)
Benzene	9.73E-05	1.0E-01			1.45E-06
1,2-dichloroethane	2.55E-04	7.3E-02			2.78E-06
Ethylene dibromide	9.15E-05	2.5E-01			3.41E-06
Naphthalene	7.14E-05	1.2E-01			1.28E-06
TOTAL PATHWAY RISK					8.91E-06
TOTAL CANCER RISK ALL PATHWAYS					2.40E-02

NOTES:
Risk calculated using equations and default exposure factors mandated in PEA Guidance Manual, 1994

TABLE 3

Hazard Calculations

Residential Property Use - Maximum Concentrations

Former Pure-Etch Facility, Salinas, CA

TOXICITY HAZARD - WATER INGESTION AND DERMAL CONTACT					
COMPOUND	RfDo (mg/kg-day)$^{-1}$	RfDi (mg/kg-day)$^{-1}$	Cw (mg/L)	Kp	Hazard Quotient
Benzene	3.0E-03	1.7E-02	6.8	2.1E-02	1.73E+02
Toluene	2.0E-01	8.6E-02	21	4.5E-02	2.27E+01
Ethylbenzene	1.0E-01	5.7E-01	2.8	7.4E-02	2.24E+00
Xylenes	2.0E-01	2.0E-01	12	8.0E-02	7.98E+00
1,2-dichloroethane	3.0E-02	1.4E-03	0.14	5.3E-03	6.69E+00
Ethylene dibromide	9.0E-03	2.6E-03	0.044	3.3E-03	1.39E+00
Naphthalene	2.0E-02	2.6E-03	0.089	6.9E-02	2.52E+00
TOTAL PATHWAY HAZARD INDEX					2.17E+02

TOXICITY HAZARD - SOIL INGESTION AND DERMAL CONTACT				
COMPOUND	RfDo (mg/kg-day)$^{-1}$	Cs (mg/kg)	ABS (fraction)	Hazard Quotient
Benzene	3.0E-03	27	0.10	2.30E-01
Toluene	2.0E-01	150	0.10	1.92E-02
Ethylbenzene	1.0E-01	140	0.10	3.58E-02
Xylenes	2.0E-01	810	0.10	1.04E-01
1,2-dichloroethane	3.0E-02	6.2	0.10	5.29E-03
Ethylene dibromide	9.0E-03	6.2	0.10	1.76E-02
Naphthalene	2.0E-02	27	0.10	3.46E-02
TOTAL PATHWAY HAZARD INDEX				4.47E-01

TOXICITY HAZARD - INHALATION			
COMPOUND	RfDi (mg/kg-day)$^{-1}$	Ca (mg/m^3)	Hazard Quotient
Benzene	1.7E-02	9.73E-05	3.64E-03
Toluene	8.6E-02	3.27E-03	2.44E-02
Ethylbenzene	5.7E-01	3.86E-03	4.32E-03
Xylenes	2.0E-01	1.82E-02	5.82E-02
1,2-dichloroethane	1.4E-03	2.55E-04	1.16E-01
Ethylene dibromide	2.6E-03	9.15E-05	2.25E-02
Naphthalene	2.6E-03	7.14E-05	1.78E-02
TOTAL PATHWAY HAZARD INDEX			2.47E-01

TOTAL HAZARD INDEX ALL PATHWAYS	2.17E+02

NOTES:

Hazard calculated using equations and default exposure factors mandated in PEA Guidance Manual, 1994

TABLE 4
Cancer Risk and Toxicity Hazard Calculations
Industrial/Commercial Property Use - Maximum Concentrations
Former Pure-Etch Facility, Salinas, CA

CANCER RISK - INHALATION					
COMPOUND	Ca (mg/m^3)	SFi $(mg/kg\text{-}day)^{-1}$			Risk (lifetime excess cancer)
Benzene	9.73E-05	1.0E-01			6.8E-07
1,2-dichloroethane	1.28E-04	7.3E-02			6.5E-07
Ethylene dibromide	4.58E-05	2.5E-01			8.0E-07
Naphthalene	7.14E-05	1.2E-01			6.0E-07
TOTAL PATHWAY RISK					2.7E-06
TOXICITY HAZARD - INHALATION					
COMPOUND	Ca (mg/m^3)	RfDi $(mg/kg\text{-}day)^{-1}$			Hazard Quotient
Benzene	9.73E-05	1.7E-02			1.1E-03
Toluene	3.27E-03	8.6E-02			7.5E-03
Ethylbenzene	3.86E-03	5.7E-01			1.3E-03
Xylenes	1.82E-02	2.0E-01			1.8E-02
1,2-dichloroethane	2.55E-04	1.3E-04			1.8E-02
Ethylene dibromide	9.15E-05	4.6E-05			3.4E-03
Naphthalene	7.14E-05	2.6E-03			5.4E-03
TOTAL PATHWAY HAZARD INDEX					5.4E-02

NOTES:
Pathways for soil and water exposures through ingestion or dermal contact were determined to be incomplete exposure pathways.

TABLE 5
SUMMARY OF INDOOR AIR SCREENING EVALUATION
Former Pure-Etch Facility, Salinas, CA

INDOOR AIR RISK USING VAPOR INTRUSION GUIDANCE DOCUMENT						
COMPOUND	CONCENTRATION (mg/M^3)	FACTOR	RESULTS	STANDARD	RATIO OF RESULTS TO STANDARD	EXCEED?
BENZENE	4.5	0.001	0.0045	0.12	0.0375	No
DCA	1	0.001	0.001	0.17	0.0058824	No
EDB	1	0.001	0.001	NONE	NA	NA
NAPHTHALENE	1	0.001	0.001	0.11	0.0090909	No
TOLUENE	1100	0.001	1.1	380	0.0028947	No
ETHYLBENZENE	170	0.001	0.17	NONE	NA	NA
XYLENES	2410	0.001	2.41	880	0.0027386	No
CUMULATIVE RISK					0.0581066	No

NOTES:
Indoor air screening evaluation conducted pursuant to *Interim Final Guidance for the Evaluation and Mitigation of Subsurface Vapor Intrusion to Indoor Air,* Cal/EPA DTSC, December 15, 2004 (Revised February 7, 2005)

TABLE 6
PROPOSED PRELIMINARY REMEDIAL GOALS
Former Pure-Etch Facility, Salinas, CA

PROPOSED PRELIMINARY REMEDIAL GOALS FOR SOIL

COMPOUND	Proposed PRG[1] (mg/kg)	Risk - Industrial (inhalation)	Hazard - Industrial (inhalation)	Risk - Industrial (dermal/ingestion)	Hazard - Industrial (dermal/ingestion)	DTSC Concurrence?
Benzene	1.4	5.E-08	6.5E-04	Not considered a completed exposure pathway for industrial Site use.		Yes
Toluene	520		3.6E-03			Yes
Ethylbenzene	400		5.6E-03			Yes
Xylenes	420		2.9E-03			Yes
1,2-dichloroethane	0.6	1.E-08	2.8E-05			Yes
Ethylene dibromide	0.073	1.E-07	1.1E-05			Yes
Naphthalene	4.2	2.E-07	1.7E-04			Yes
CUMULATIVE RISK/HAZARD		**4.E-07**	**1.3E-02**			

PROPOSED PRELIMINARY REMEDIAL GOALS FOR GROUNDWATER

COMPOUND	Initial Proposed PRG[2] (ug/L)			Risk - Industrial (dermal/ingestion)	Hazard - Industrial (dermal/ingestion)	DTSC Concurrence?	Revised PRG Required by DTSC[3] (ug/L)
Benzene	340			Not considered a completed exposure pathway for industrial Site use.		No	1
Toluene	1,050					No	150
Ethylbenzene	700					No	300
Xylenes	1,750					Yes	1,750
1,2-dichloroethane	21					No	0.5
Ethylene dibromide	8					No	0.05
Naphthalene	21					Yes	21

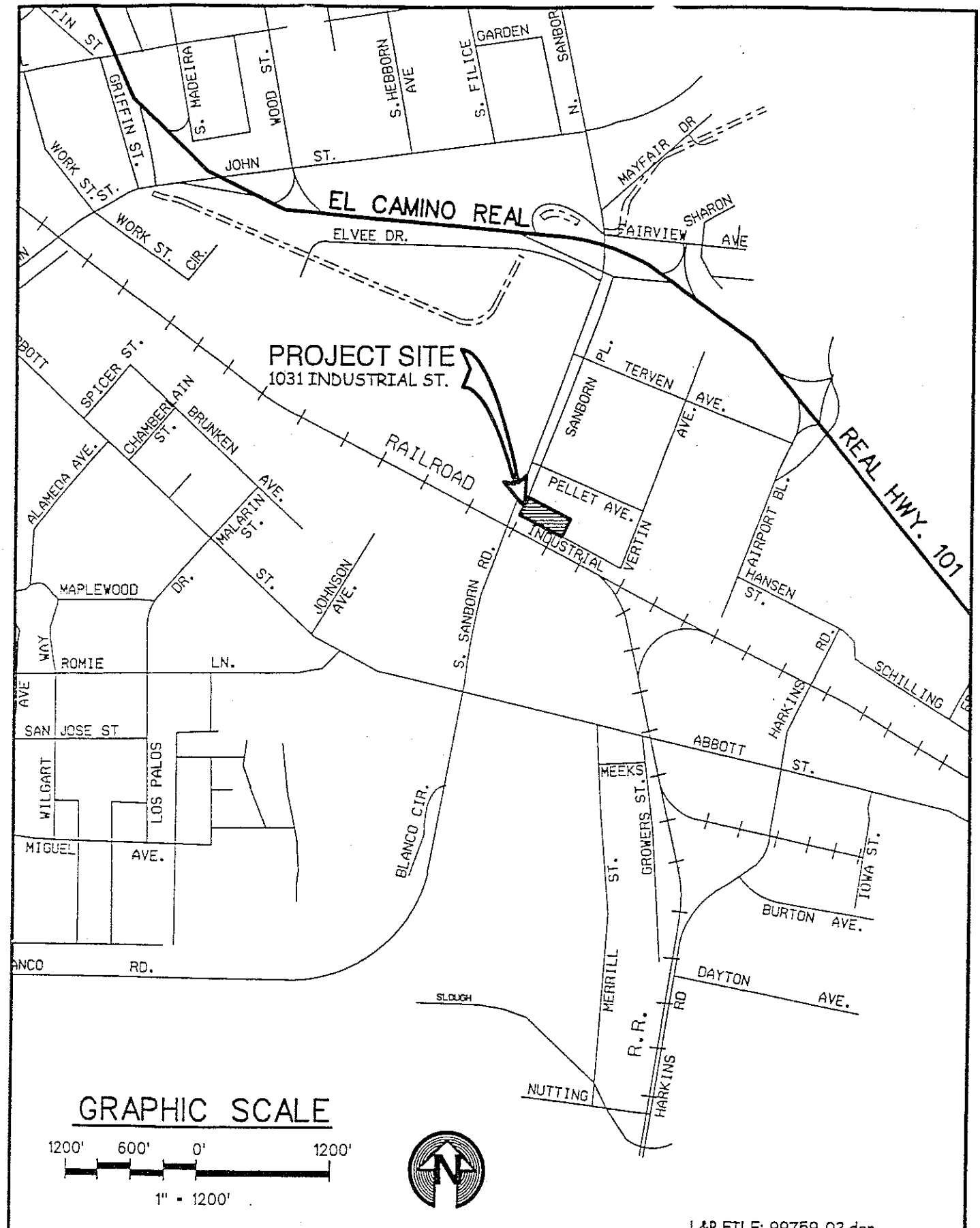
NOTES:

Site specific risk assessment determined that only VOC inhalation air pathway is complete for industrial Site use.

[1] = Proposed soil PRGs are adopted from USEPA Region IX PRGs established for industrial Site use.

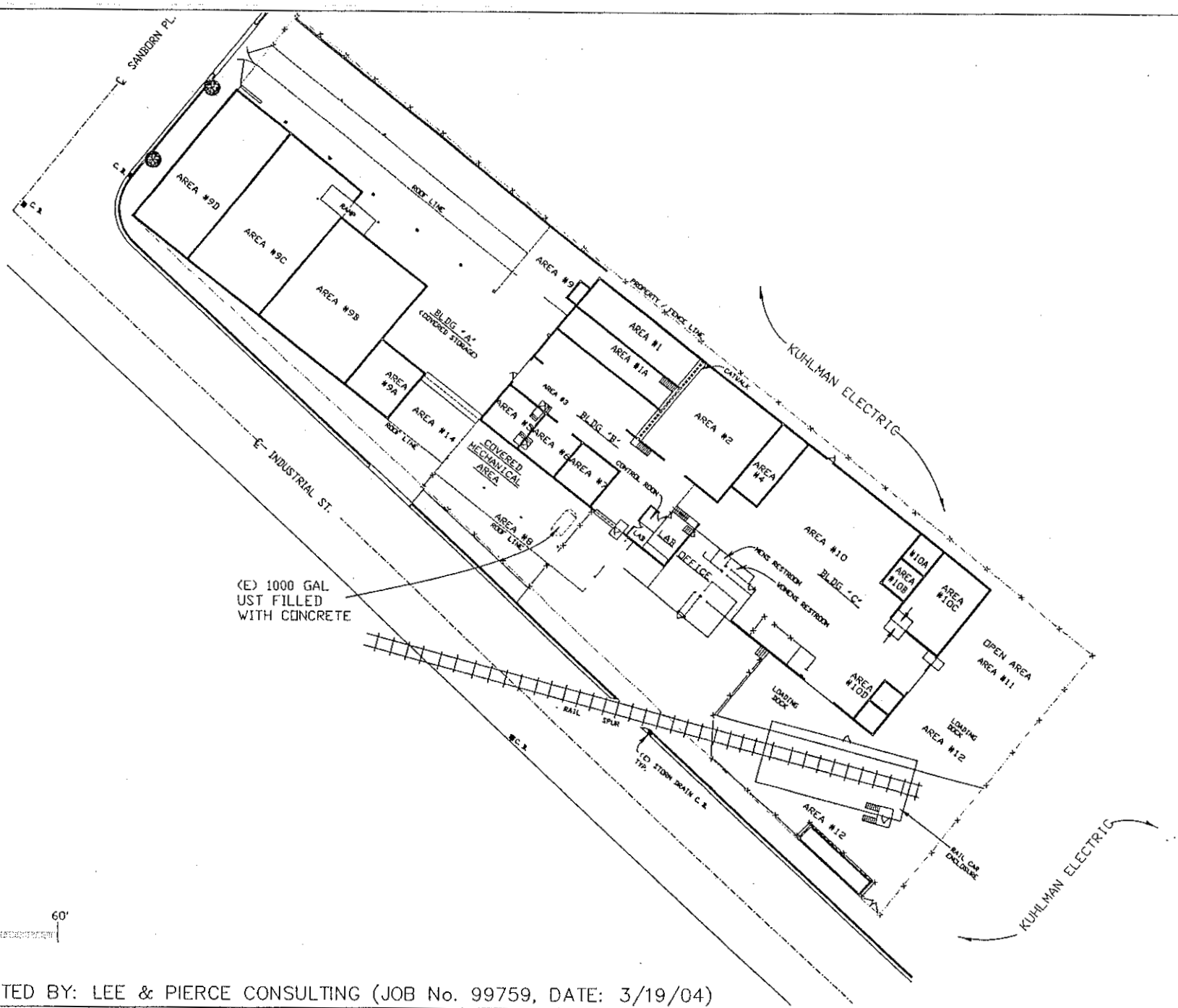
[2] = Initial proposed groundwater PRGs for BTEX constituents were selected based upon 95% reduction in current groundwater contamination or 100X the current drinking water MCL, whichever was less. Initial proposed groundwater PRGs for EDB and 1,2-DCA reflected maximum background concentrations, based upon detected concentrations in upgradient and downgradient wells not impacted by gasoline constituents. Since no MCLs have been established for Naphthalene in groundwater, the Taste and Odor Threshold was selected as the initial proposed PRG.

[3] = DTSC requires that groundwater PRGs be reduced to the levels of their corresponding MCLs.



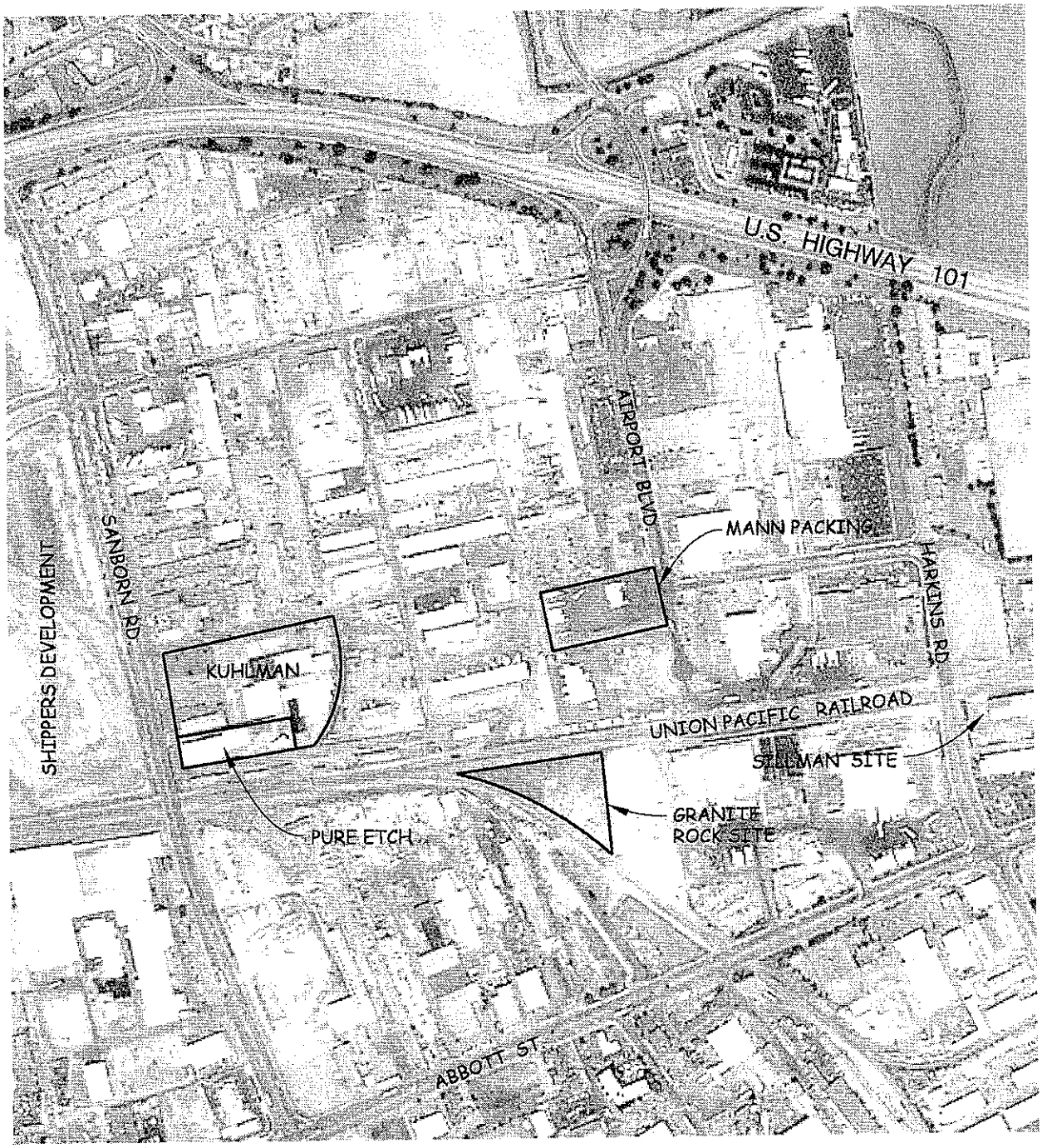
L&P FILE: 99759-02.dgn

LOCATION MAP PURE ETCH SALINAS, CALIFORNIA	LEE & PIERCE, inc. consulting engineers 546 ABBOTT ST. SUITE 20 SALINAS, CA 93901	JOB No. 99759 DATE: 04-12-00 BY: DP	SHT No



SOURCE: MAP CONSTRUCTED BY: LEE & PIERCE CONSULTING (JOB No. 99759, DATE: 3/19/04)

GROUND ZERO ANALYSIS	SITE PLAN PURE ETCH COMPANY 1031 INDUSTRIAL ST., SALINAS, CALIFORNIA	FIGURE 2 FN: 0605/365S



600' 0' 600'

1" = 600'-0"

L&P FILE: 99759-03.dgn

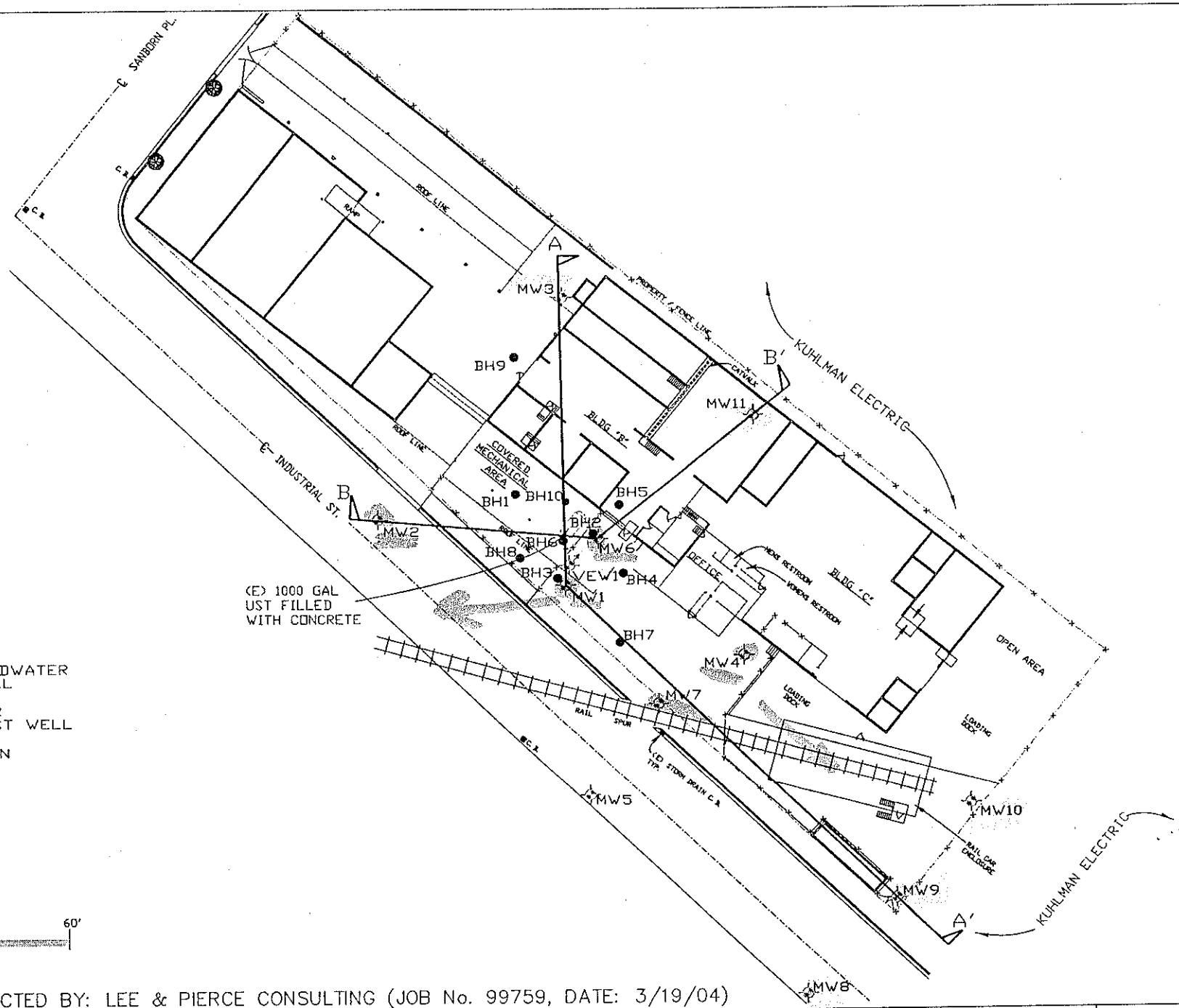
AERIAL PHOTOMAP

PURE ETCH
SALINAS, CALIFORNIA

LEE & PIERCE, inc.
consulting engineers
546 ABBOTT ST., SUITE 20
SALINAS, CA 93901

JOB No. 00759	SHT No
DATE: 04-13-00	
BY: DP	

FIGURE 3



LEGEND:

- MW1 — EXISTING GROUNDWATER MONITORING WELL
- VEW1 — EXISTING VAPOR EXTRACTION TEST WELL
- BH10 — BORING LOCATION

60' 0' 60'

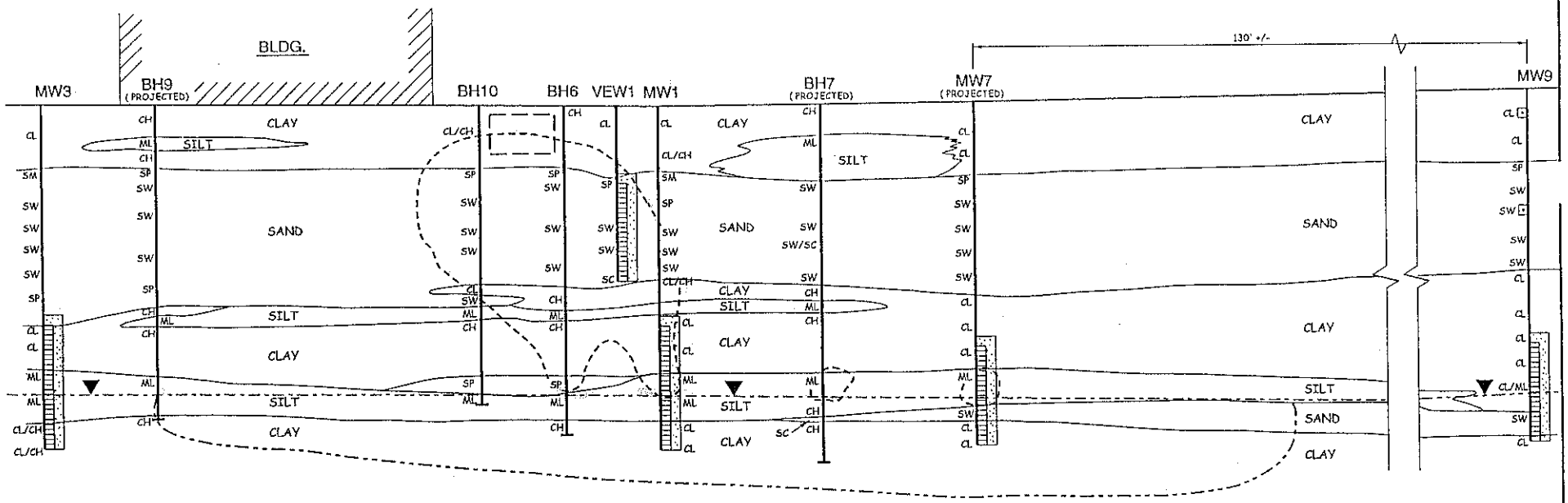
1" = 60'-0"

SOURCE: MAP CONSTRUCTED BY: LEE & PIERCE CONSULTING (JOB No. 99759, DATE: 3/19/04)

GROUND ZERO ANALYSIS

LOCATIONS OF BORINGS, MONITORING WELLS, AND LINES OF SECTION
PURE ETCH COMPANY
1031 INDUSTRIAL ST.,
SALINAS, CALIFORNIA

FIGURE
4
FN: 0605/365S



LEGEND:

- CONTAMINATED SOIL CONTOUR
- CONTAMINATED GROUNDWATER CONTOUR
- GROUNDWATER LEVEL 01/30/04
- TD — TOTAL DEPTH
- WELL SHOWING SCREEN AND SANDPACK
- VAPOR PROBE IN ANNULUS SHOWING SANDPACK

20' 10' 0' 20'

1" = 20'-0"

INFORMATION PROVIDED BY:
GROUND ZERO ANALYSIS, INC.

L&P FILE: 99759-10.dgn

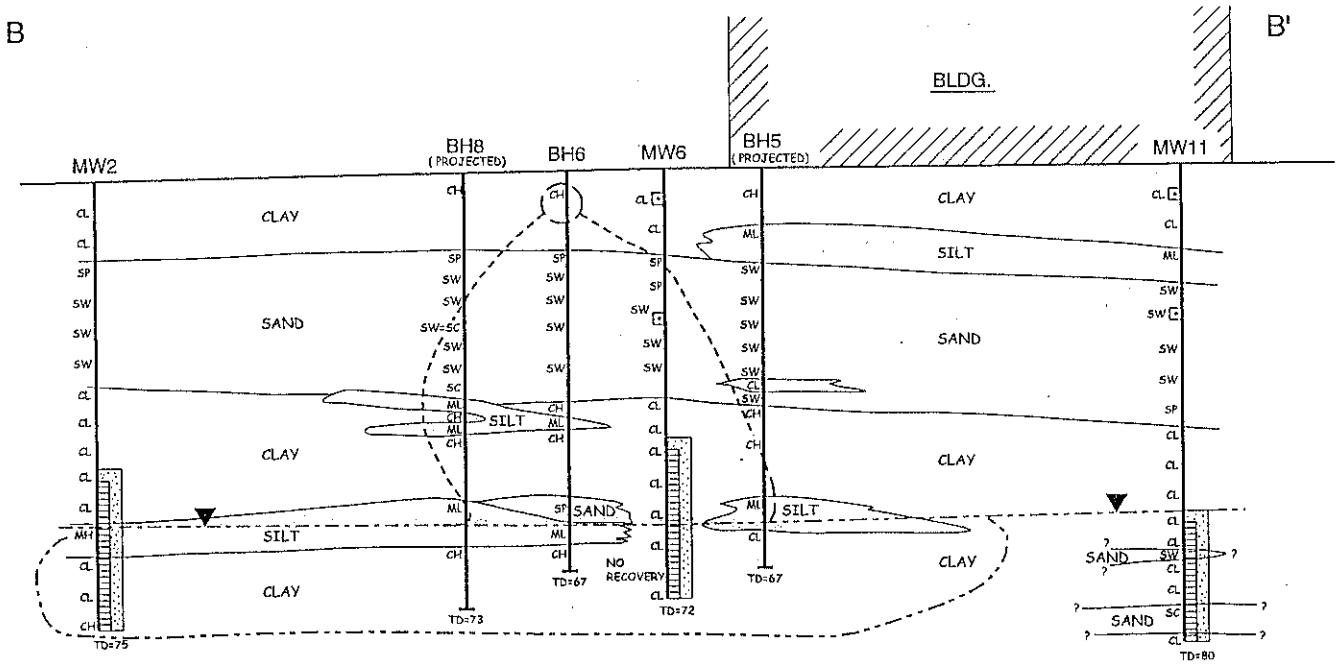
STRATIGRAPHIC CROSS SECTION A-A'

PURE ETCH COMPANY
SALINAS, CALIFORNIA

LEE & PIERCE, inc.
consulting engineers
546 ABBOTT ST., SUITE 20
SALINAS, CA 93901

JOB No. 99759
DATE: 03-19-04
BY: DP
SHT No

FIGURE 5



LEGEND:

- CONTAMINATED SOIL CONTOUR
- CONTAMINATED GROUNDWATER CONTOUR
- GROUNDWATER LEVEL 01/30/04
- TD — TOTAL DEPTH
- WELL SHOWING SCREEN AND SANDPACK
- VAPOR PROBE IN ANNULUS SHOWING SANDPACK

20' 10' 0' 20'

1" = 20'-0"

INFORMATION PROVIDED BY:
GROUND ZERO ANALYSIS, INC.

L&P FILE: 99759-10.dgn

STRATIGRAPHIC CROSS SECTION B-B'

PURE ETCH COMPANY
SALINAS, CALIFORNIA

LEE & PIERCE, inc.
consulting engineers
546 ABBOTT ST., SUITE 20
SALINAS, CA 93901

JOB No. 99759
DATE: 03-19-04
BY: DP
SHT No

FIGURE 6